Contact us:

Hazards Mitigation Center

Lawrence Livermore
National Laboratory
P.O. Box 808, L-203
Livermore, CA 94550
(925) 423-2004
Fax (925) 423-2163

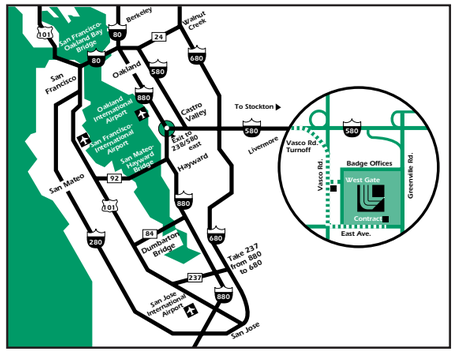
Paul Kasameyer, Geophysics
(925) 422-6487
e-mail kasameyer1@llnl.gov

Robert Murray, Structural Engineering
(925) 422-0308
e-mail murray6@llnl.gov

Jean Savy, Hazards/Risks
(925) 423-0196
e-mail savy1@llnl.gov

Visit our Web site:
http://www-ep.es.llnl.gov/www-ep/ghp.html

Our connection with the University of California provides access to other research centers that collaborate on projects for which our blends of skills and capabilities are useful.



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So the Next Event is NOT a Disaster!

University of California
Lawrence Livermore National Laboratory

The Lawrence Livermore National Laboratory's Hazards Mitigation Center (HMC) is a scientific and technical team that can help clients anticipate, handle, and mitigate natural and man-made hazards.

Vision Statement

The HMC is an important contributor to the nation's ability to understand, plan for, mitigate, and respond to natural and man-made hazards.

Mission Statement

The HMC (1) provides state-of-the-art, relevant, defensible, and unbiased hazards mitigation analyses and resources, and (2) serves a broad range of clients, including government, industry, and the military.

Role of the HMC

- Integrate research, development, and the application of technologies.
- Understand hazards and produce cost-effective solutions.
- Provide integrated, source-to-response solutions from an unbiased perspective.
- Act as LLNL's internal and external point of contact for hazards analysis and mitigation.
- Identify, develop, and maintain integrated measurement, modeling, and hazard-characterization capabilities.
- Focus its expertise on reducing the effects of hazards.

Unique Capabilities

As part of Lawrence Livermore National Laboratory, the Hazards Mitigation Center has unique capabilities that ensure clients receive scientifically valid information to help them effectively plan hazards mitigation projects.

Independent, Unbiased Resource

We operate as an independent, unbiased resource for scientific information; our clients benefit from the fact that we have no conflicts of interest.

Supercomputers

As a Center within LLNL, we have access to the most advanced supercomputers in the world, the most highly qualified computer specialists, and an array of zone-generation, post-processing, and visualization software.

Simulations

We can perform unique, complex, and powerful computer simulations. These include realistic 3-D models of hazards, such as seismic, extreme winds, floods, tornadoes, and blasts. We also do realistic, nonlinear structural modeling for both new designs and retrofits of complex structures.

Real-Time Advisories

In conjunction with LLNL's Atmospheric Release Advisory Capability (ARAC), we can respond to natural and man-made disasters in real time by predicting the movement of hazardous materials in the atmosphere.

Instrumentation

We have strong instrumentation, data processing, and communication capabilities. We use uphole and downhole weak- and strong-motion sensors for site characterization, strong-motion synthesis, and wave coherency studies. We develop and deploy hardened, real-time warning systems, and microsensor-based environmental instrumentation.

Specialized Facilities

We have access to specialized experimental facilities that increase our ability to solve clients' problems. The Center for Accelerator Mass Spectrometry at LLNL is used to rapidly determine the age of geologic materials for paleoseismic studies. The Rock Physics labs at LLNL are used to characterize soils and rocks and their response. We also have access to the Geographic Information Sciences Center, Computer-Aided Tomography facilities, and the LLNL Seismic Observatory.

Basic Tools and Integrated Capabilities

Hazard

- Strong ground-motion synthesis using 3-D geologic models and *in situ* seismic recorders.
- Structural analysis to ensure that new structures use up-to-date techniques and materials that mitigate natural disasters.
- Integration of expert opinion into hazard estimation.
- Soil-structure interaction analysis.
- Site response analysis.

Risk

- Fragility analysis.
- Risk analysis for seismic and other hazards, based on multivariable probabilistic analysis.
- Software development for calculating seismic losses.

Mitigation

- Development of natural phenomena hazards design and evaluation criteria.
- Walkdown inspections.
- Peer reviews.
- Earthquake alert systems to gain 0–30 seconds of warning before strong shaking.
- Portable, deployable aftershock warning systems.

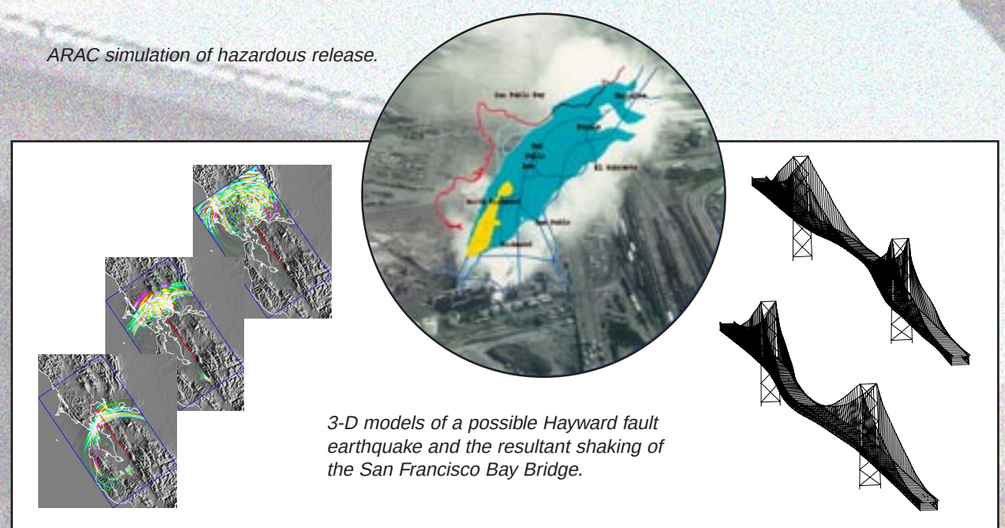
General Capabilities

- Neural networks.
- Remote sensors.
- Systems identification/signal processing.
- Modal testing and analysis.

Basic Seismic Research

We are carrying out basic scientific research to advance our fundamental understanding of earthquake processes and structural responses so that we can anticipate hazards and enable their mitigation.

ARAC simulation of hazardous release.



3-D models of a possible Hayward fault earthquake and the resultant shaking of the San Francisco Bay Bridge.

Current HMC Projects

We have installed borehole weak- and strong-motion sensors to assess the effects of geologic conditions on seismic inputs to bridges crossing San Francisco Bay. The instruments provide multiple-use data important for geotechnical, structural engineering, and seismological studies. Weak-motion data enable us to evaluate the seismicity of potentially active faults, the variability of ground motion along the bridges, and constraints on soil models, as well as to record empirical Green's functions for synthesis of input ground motion for design and retrofit studies. Strong-motion data provide a basis for understanding nonlinear soil response, incoherent motion along bridges, seismic attenuation, and long-period effects.